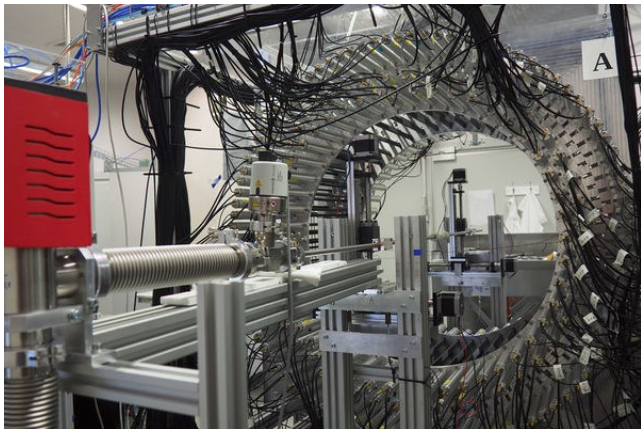


Scientific supervisor	
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Department	Experimental Particle Physics and Applications
Laboratory	J-PET
Group webpage	<a href="http://koza.if.uj.edu.pl/">http://koza.if.uj.edu.pl/</a>
<b>Proposed research topic</b> <i>Determination of positronium lifetime in samples of heart tumors.</i>	
<b>Short description (&lt; 1000 characters)</b>  <p>The aim of the research is to determine the lifetime of the positronium, an atom consisting of an electron and a positron (electron antiparticle, which is formed as a result of the decay of <math>\beta^+</math> in a pharmaceutical), in samples of heart tumors (cardiac myxoma). The positronium decays into gamma quanta as a result of the annihilation of the positron with the bound electron, or with another electron from the environment. The lifetime of a positronium is influenced by the number of electrons available around it. It is possible to use this relationship for non-invasive examination of the density of neoplastic tissue. The described, modern method has been developed in the J-PET group.</p> <p>During the internship, the student will have the opportunity to acquire knowledge about the conducted research (theoretical basis, statistics), learn about the J-PET detection system unique in the world (Fig. 1) (learning how to use the device, conduct measurements), and then perform the experiment prepared by him. in which the pharmaceutical will be placed in several tumor samples (immersed in formalin). The collected data will then be analyzed for the measurement of positronium lifetime in tumor samples.</p>	
<div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>Fig. 1 J-PET detector used to perform measurements, with a small annihilation chamber inside.</p> <p>The level of research will be adapted to the degree of study. Each step of the experimental work and data analysis will be explained on an ongoing basis and according to individual needs.</p> </div> </div>	
<b>Main research tool</b> J-PET detector, oscilloscope, C++/python, ROOT library	
<b>Additional requirements to the candidate</b> Students of physics, medical physics and biophysics are preferred. Nice to have: willingness to learn, research enthusiasm, diligence and punctuality.	
<b>Possibility to continue student internship in the form of:</b>	
Diploma thesis (master's or bachelor's degree)	<b>X</b>
PhD study	<b>X</b>